Claims

What is claimed is:

1. A microturbine engine operable to combust a flow of VOCs without a combustor, the microturbine engine comprising:

a compressor having an inlet, the inlet receiving a mixture of air and VOCs, the compressor operable to produce a flow of compressed air and VOCs;

a reaction chamber including a reactor bed, the flow of compressed air and VOCs being combusted within the reactor bed to produce a flow of products of combustion;

a turbine driven by the flow of products of combustion from the combustor;

a generator coupled to the turbine, the generator driven by the turbine at a speed to produce electrical power.

2. The microturbine engine of claim 1, wherein the compressor is a single stage radial flow compressor.

3. The microturbine engine of claim 1, wherein the reactor bed includes a honeycomb portion having a length, the flow of compressed air and VOCs being substantially combusted along the length of the reactor bed.

4. The microturbine engine of claim 1, wherein the reactor bed includes a plurality of pebbles defining a length, the flow of compressed air and VOCs being substantially combusted along the length of the reactor bed.

5. The microturbine engine of claim 1, further comprising a fuel burner spaced from the reactor bed.

6. The microturbine engine of claim 5, wherein the fuel burner includes a ring facing an inlet of the reactor bed, the ring including a plurality of gas nozzles directed at the reactor bed and operable to combust a gaseous fuel.

7. The microturbine engine of claim 1, further comprising a fuel inlet in fluid communication with the flow of compressed air and VOCs, the fuel inlet being selectively operable to deliver a flow of fuel to the engine.

8. The microturbine engine of claim 7, further comprising a sensor operable to measure a temperature, and a controller operably interconnected to the sensor and operable to control the flow of fuel delivered to the engine in response to the measured temperature.

9. The microturbine engine of claim 8, wherein the sensed temperature is a turbine inlet temperature.

10. The microturbine engine of claim 1, wherein the turbine includes a single stage radial flow turbine.

11. The microturbine engine of claim 1, wherein the generator is a synchronous generator.

12. A microturbine engine comprising:

a compressor having an inlet in fluid communication with a mixture of air and VOCs, the compressor operable to compress the mixture to produce a flow of compressed air and VOCs;

a recuperator in fluid communication with the compressor to receive the flow of compressed air and VOCs, the flow of compressed air and VOCs exiting the recuperator as a flow of preheated compressed air and VOCs;

a reaction chamber including a reactor bed, the flow of preheated compressed air and VOCs being combusted within the reactor bed to produce a flow of products of combustion, the flow of products of combustion being heated to a desired temperature substantially by the recuperator and the reaction chamber;

a turbine driven by the flow of products of combustion from the combustor; and

a synchronous generator driven by the turbine to output electrical power.

13. The microturbine engine of claim 12, wherein the compressor is a single stage radial flow compressor.

14. The microturbine engine of claim 12, wherein the reactor bed includes a honeycomb portion having a length, the flow of compressed air and VOCs being substantially combusted along the length of the reactor bed.

15. The microturbine engine of claim 12, wherein the reactor bed includes a plurality of pebbles defining a length, the flow of compressed air and VOCs being substantially combusted along the length of the reactor bed.

16. The microturbine engine of claim 12, further comprising a fuel burner spaced from the reactor bed.

17. The microturbine engine of claim 16, wherein the fuel burner includes a ring facing an inlet of the reactor bed, the ring including a plurality of gas nozzles directed at the reactor bed and operable to combust a gaseous fuel.

18. The microturbine engine of claim 12, further comprising a fuel inlet in fluid communication with the flow of compressed air and VOCs, the fuel inlet being selectively operable to deliver a flow of fuel to the engine.

19. The microturbine engine of claim 18, further comprising a sensor operable to measure a temperature, and a controller operably interconnected to the sensor and operable to control the flow of fuel being delivered to the engine in response to the measured temperature.

20. The microturbine engine of claim 19, wherein the sensed temperature is a turbine inlet temperature.

21. The microturbine engine of claim 12, wherein the turbine includes a single stage radial flow turbine.

22. The microturbine engine of claim 12, wherein the recuperator includes a plate-fin heat exchanger.

23. A method of combusting VOCs without a combustor and generating electricity using a turbine operable to drive a synchronous generator, the method comprising:

operating a compressor to compress a flow of air and VOCs;

delivering the compressed flow of air and VOCs to a reaction chamber having a reactor bed;

passing the flow of air and VOCs through the reactor bed, the reactor bed acting to combust the VOCs and produce a flow of products of combustion exiting the reactor bed at a desired temperature;

passing the flow of products of combustion through the turbine, the turbine rotating in response to the flow of products of combustion; and

rotating the generator in response to the rotation of the turbine, the generator producing a flow of electricity.

24. The method of claim 23, further comprising selectively injecting a flow of fuel into the flow of air and VOCs.

25. The method of claim 24, further comprising measuring a temperature and injecting the flow of fuel in response to the measured temperature.

26. The method of claim 23, further comprising synchronizing the generator output to at least one of a priority load and a utility grid to provide usable electrical power.